

FATIMA JINNAH WOMEN UNIVERSITY DEPARTMENT OF SOFTWARE ENGINEERING

SUBMITTED BY:

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(2021-BSE-032)

SEMESTER:

V-A

COURSE:

CLOUD COMPUTING LAB

SUBMITTED TO:

ENGR. SHAHZAD NAZIR

LAB-08

Step 1:

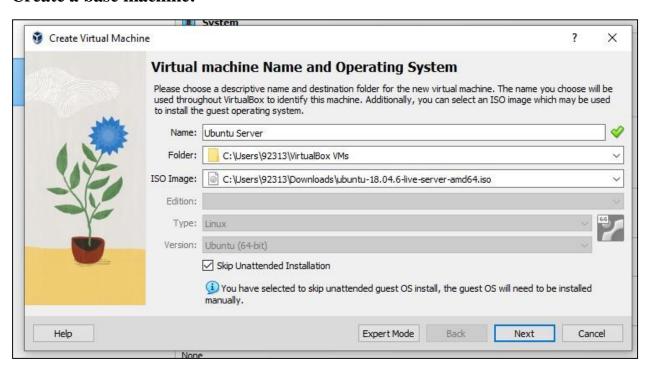
Download and install Oracle Virtual Box:

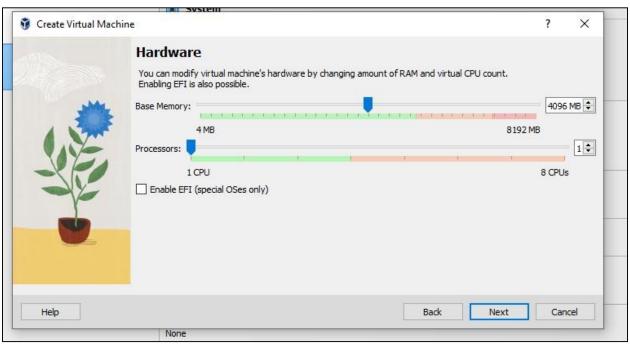
Step 2:

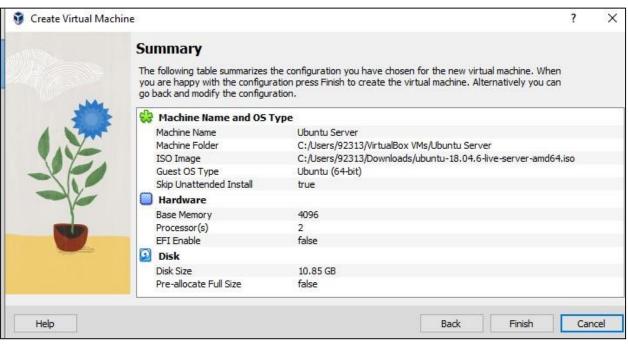
Download Ubuntu Server 18.04

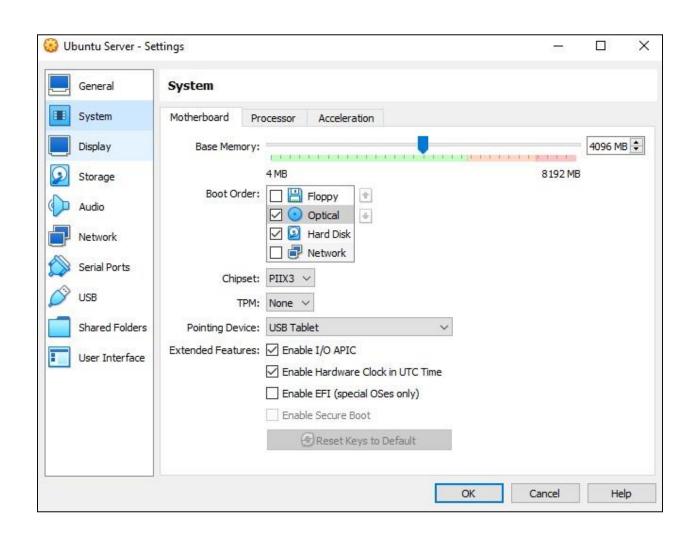
Step 3:

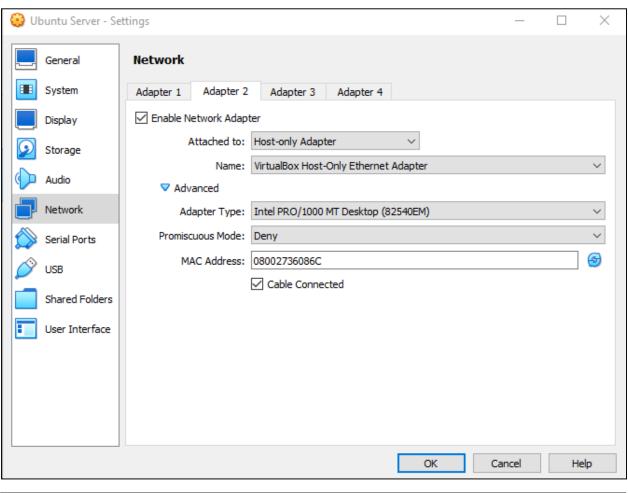
Create a base machine:

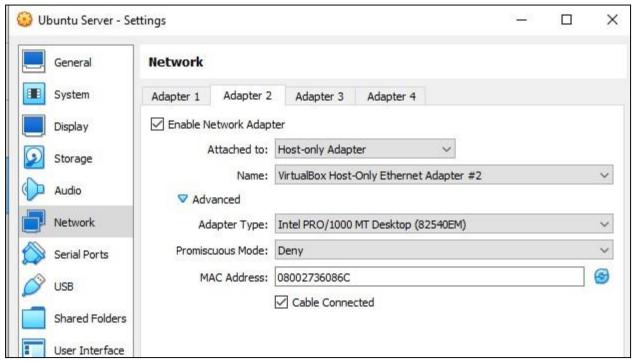


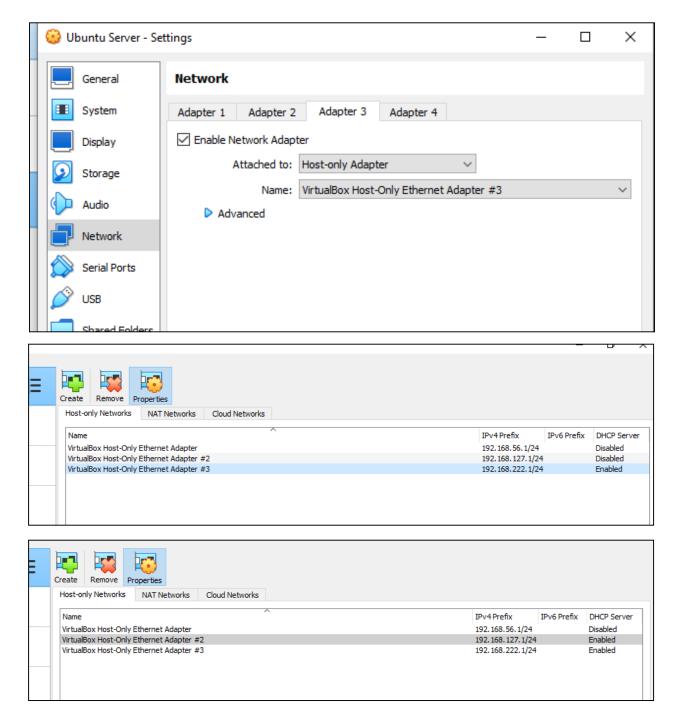












Profile setup:

Profile setup	[Help]	
	password you will use to log in to the system. You can the next screen but a password is still needed for	
Your name:	fjwu	
Your server's name:	server1 The name it uses when it talks to other computers.	
Pick a username:	fjwu	
Choose a password:	жжжж	
Confirm your password:	***	

NOPASSWD Command:

```
root@server1:~# echo "stack ALL=(ALL) NDPASSWD: ALL">/etc/sudoers.d/stack root@server1:~# cat /etc/sudoers.d/stack stack ALL=(ALL) NDPASSWD: ALL root@server1:~# exit logout fjwu@server1:~$ _

fjwu@server1:~$ sudo su - root@server1:~# clear_
```

Update the Server1:

```
oot@server1:~# apt–get update
Hit:1 http://pk.archive.ubuntu.com/ubuntu bionic InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu bionic–updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu bionic-backports InRelease
Hit:4 http://pk.archive.ubuntu.com/ubuntu bionic–security InRelease
Reading package lists... Done
root@server1:~# apt-get dist-upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following NEW packages will be installed:
 ubuntu–pro–client–l10n
The following packages will be upgraded:
apt apt—utils command—not—found command—not—found—data distro—info—data iptables klibc—utils
  landscape-common libapt-inst2.0 libapt-pkg5.0 libc-bin libc6 libip4tc0 libip6tc0 libiptc0
  libkeyutils1 libklibc liblxc-common liblxc1 libnetplan0 libunwind8 libxtables12 linux-base
  locales lxcfs lxd lxd-client multiarch-support netplan.io nplan open-iscsi open-vm-tools
  openssh-client python-apt-common python3-apt python3-commandnotfound python3-software-properties
  software-properties-common sosreport topdump ubuntu-advantage-tools ufw update-notifier-common
43 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 23.0 MB of archives.
After this operation, 1,202 kB disk space will be freed.
Do you want to continue? [Y/n]
```

Upgrade the Server1:

```
Reading package lists... Done
root@controller:~# apt-get dist-upgrade
Reading package lists... Done
```

Install Packages:

```
root@controller:"# apt-get install vim make perl ifupdown gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
vim is already the newest version (2:8.0.1453-1ubuntu1).
perl is already the newest version (5.26.1-6ubuntu0.3).
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu cpp cpp-7 gcc-7 gcc-7-base libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0 libcilkrts5 libgcc-7-dev libgomp1 libis119 libitm1 liblsan0 libmpc3 libmpx2 libquadmath0 libtsan0 libubsan0 linux-libc-dev
  manpages-dev
 Suggested packages:
  binutils-doc cpp-doc gcc-7-locales gcc-multilib autoconf automake libtool flex bison gdb gcc-doc
  gcc-7-multilib gcc-7-doc libgcc1-dbg libgomp1-dbg libitm1-dbg libatomic1-dbg libasan4-dbg
  liblsan0-dbg libtsan0-dbg libubsan0-dbg libcilkrts5-dbg libmpx2-dbg libquadmath0-dbg ppp rdnssd
  glibc-doc make-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu cpp cpp-7 gcc gcc-7 gcc-7-base ifupdown
libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0 libcilkrts5 libgcc-7-dev
  libgomp1 libis119 libitm1 liblsan0 libmpc3 libmpx2 libquadmath0 libtsan0 libubsan0
  linux-libc-dev make manpages-dev
O upgraded, 29 newly installed, O to remove and O not upgraded.
Need to get 27.1 MB of archives.
After this operation, 115 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
    [Connecting to us.archive.ubuntu.com]
```

Configure the networking:

```
File Machine View Input Devices Help
root@controller:"# vim /etc/network/interfaces
-
```

```
File Machine View Input Devices Help
# ifupdown has been replaced by netplan(5) on this system. See
# /etc/netplan for current configuration.
# To re-enable ifupdown on this system, you can run:
# sudo apt install ifupdown
```

```
auto lo
iface lo inet loopback

auto enpOs3
iface enpOs3 inet dhcp

auto enpOs8
iface enpOs8 inet static
 address 10.0.0.11
 netmask 255.255.255.0

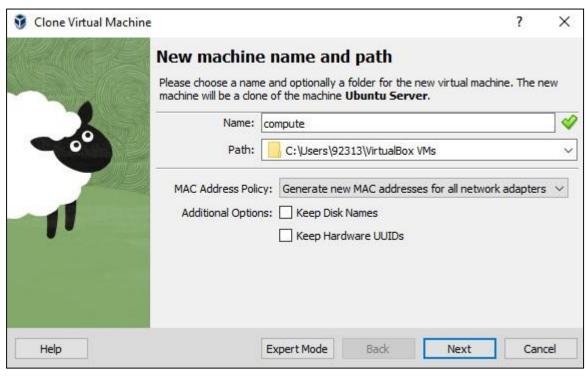
auto enpOs9
iface enpOs9 inet manual
up ip link set dev $IFACE up
```

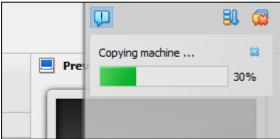
```
root@server1:~# poweroff
```

Step 4:

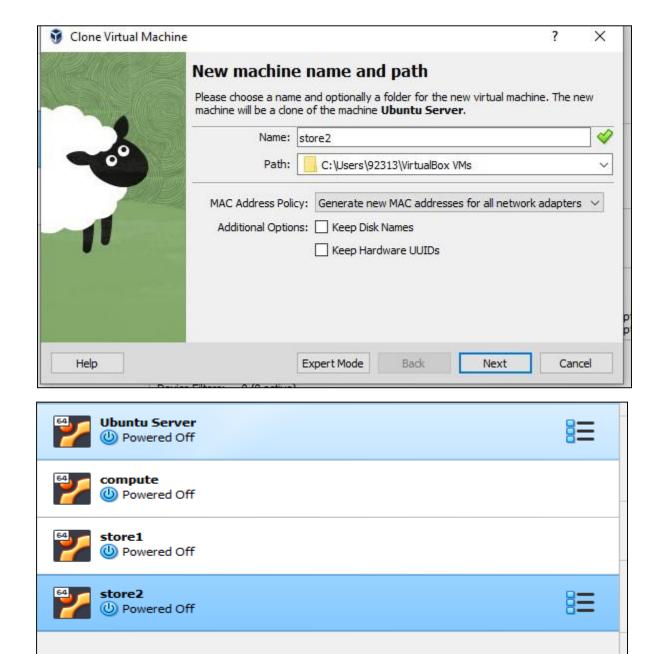
Creating clones on Ubuntu Server:

Clone 1 Compute:





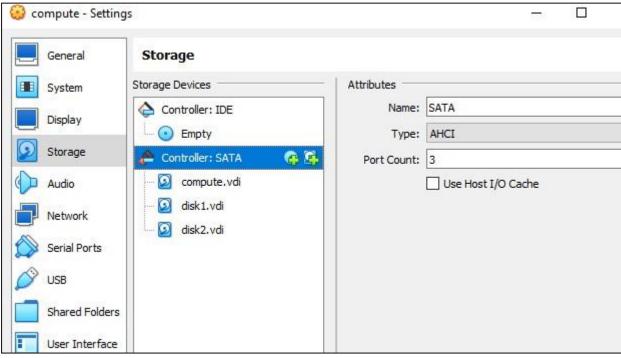
Similarly create Clone 2 store1 and Clone 3 store2:

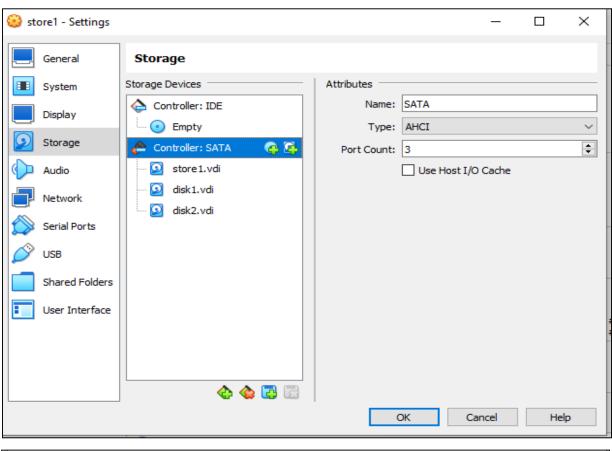


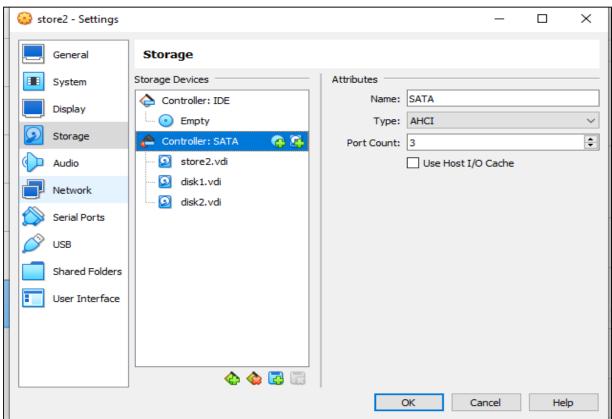
Creating virtual hard disk on all three clones:

Add two additional disks:

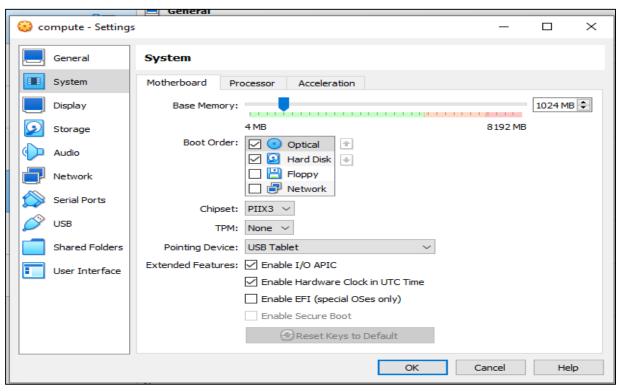


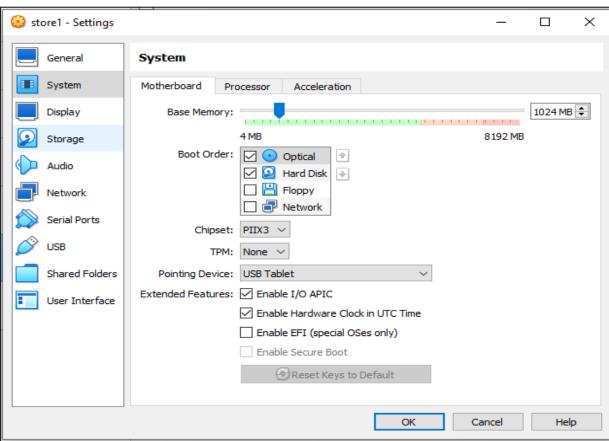


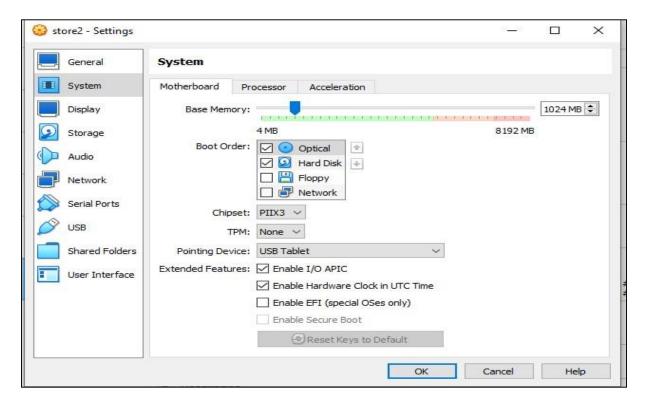




Set the RAM of all clones:







Step 5:

Start all four machines:

Configure Networking:

- 1. Interface Configuration
- 2. Local Resolver Configuration

On server1:

```
Ubuntu 18.04.6 LTS server1 tty1
server1 login: fjwu
Password:
ast login: Thu Nov 30 09:50:11 UTC 2023 on tty1
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0–213–generic x86_64)
 * Documentation: https://help.ubuntu.com
                   https://landscape.canonical.com
 * Management:
 * Support:
                   https://ubuntu.com/advantage
  System information as of Fri Dec 1 05:55:54 UTC 2023
               0.05
                                  Users logged in:
  System load:
 Usage of /:
                41.2% of 9.59GB
                                  IP address for enp0s3: 10.0.2.15
                                  IP address for enp0s8: 192.168.127.3
 Memory usage: 4%
  Swap usage:
                0%
                                  IP address for enp0s9: 192.168.222.3
  Processes:
                101
  Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
```

```
fjwu@server1:~$ sudo su –
[sudo] password for fjwu:
root@server1:~# clear
```

```
root@server1:~# vim /etc/hosts_
```

```
127.0.0.1 localhost
127.0.1.1 server1
# The following lines are desirable for IPv6 capable hosts
::1
        ip6-localhost ip6-loopback
fe00::0 ip6–localnet
ff00::0 ip6–mcastprefix
ff02::1 ip6–allnodes
ff02::2 ip6–allrouters
10.0.0.11
                server1
10.0.0.31
                compute
10.0.0.51
                store1
                store2
10.0.0.52
```

On store1:

```
Ubuntu 18.04.6 LTS server1 tty1
server1 login: fjwu
Password:
Last login: Thu Nov 30 09:50:11 UTC 2023 on tty1
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0–213–generic x86_64)
* Documentation: https://help.ubuntu.com
                  https://landscape.canonical.com
* Management:
                  https://ubuntu.com/advantage
* Support:
 System information as of Fri Dec 1 06:27:54 UTC 2023
 System load: 0.01
                                 Users logged in:
               41.2% of 9.59GB IP address for enp0s3: 10.0.2.15
 Usage of /:
 Memory usage: 17%
                                IP address for enp0s8: 192.168.127.3
 Swap usage:
               0%
                                 IP address for enp0s9: 192.168.222.3
 Processes:
               100
 * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
  just raised the bar for easy, resilient and secure K8s cluster deployment.
  https://ubuntu.com/engage/secure-kubernetes-at-the-edge
```

```
fjwu@server1:~$ sudo su –
[sudo] password for fjwu:
root@server1:~# vim /etc/network/interfaces_
```

```
# ifupdown has been replaced by netplan(5) on this system. See

# /etc/netplan for current configuration.

# To re-enable ifupdown on this system, you can run:
auto lo
iface lo inet loopback

auto enp0s3
iface enp0s3 inet dhcp

auto enp0s8
iface enp0s8 inet static
address 10.0.0.11
netmask 255.255.255.0

auto enp0s9
iface enp0s9 inet manual
up ip link set dev $IFACE up
down ip link set dev $IFACE down
```

Change the IP:

```
# /etc/netplan for current configuration.
# To re-enable ifupdown on this system, you can run:
auto lo
iface lo inet loopback

auto enpOs3
iface enpOs3 inet dhcp

auto enpOs8
iface enpOs8 inet static
address 10.0.0.51
netmask 255.255.255.0

auto enpOs9
iface enpOs9 inet manual
up ip link set dev $IFACE up
down ip link set dev $IFACE down
```

```
~
~
~
"/etc/network/interfaces" 19L, 405C written
root@server1:~# clear
```

Change hostname:

```
root@server1:~# vim /etc/hostname
```

```
store1
~
~
~
~
~
~
```

```
root@server1:~# vim /etc/hosts_
```

```
127.0.0.1 localhost
127.0.1.1 store1

# The following lines are desirable for IPv6 capable hosts
::1    ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

10.0.0.11    server1
10.0.0.31    compute
10.0.0.51    store1
10.0.0.52    store2
```

Reboot

On store 2:

```
Ubuntu 18.04.6 LTS server1 tty1
server1 login: fjwu
Password:
Last login: Thu Nov 30 09:50:11 UTC 2023 on tty1
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0–213–generic x86_64)
* Documentation: https://help.ubuntu.com
* Management:
                   https://landscape.canonical.com
                   https://ubuntu.com/advantage
* Support:
 System information as of Fri Dec 1 06:41:39 UTC 2023
 System load: 0.0
                                  Users logged in:
 Usage of /: 41.2% of 9.59GB
                                  IP address for enp0s3: 10.0.2.15
 Memory usage: 17%
                                  IP address for enp0s8: 192.168.127.3
                                  IP address for enp0s9: 192.168.222.3
 Swap usage: 0%
 Processes:
                96
* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
  just raised the bar for easy, resilient and secure K8s cluster deployment.
  https://ubuntu.com/engage/secure-kubernetes-at-the-edge
Expanded Security Maintenance for Infrastructure is not enabled.
O updates can be applied immediately.
Enable ESM Infra to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
New release '20.04.6 LTS' available.
Run 'do–release–upgrade' to upgrade to it.
fjwu@server1:~$
fjwu@server1:~$ sudo su −
[sudo] password for fjwu:
root@server1:~#
```

Change the IP:

```
# ifupdown has been replaced by netplan(5) on this system. See

# /etc/netplan for current configuration.

# To re-enable ifupdown on this system, you can run:
auto lo
iface lo inet loopback

auto enpOs3
iface enpOs3 inet dhcp

auto enpOs8
iface enpOs8 inet static
address 10.0.0.52
netmask 255.255.255.0

auto enpOs9
iface enpOs9 inet manual
up ip link set dev $IFACE up
down ip link set dev $IFACE down
```

Change hostname:

```
root@server1:~# vi /etc/hostname
```

```
store2
~
~
~
~
~
```

Clear

```
root@server1:~# vim /etc/hosts_
```

```
127.0.0.1 localhost
127.0.1.1 store2

# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

10.0.0.11     server1
10.0.0.31     compute
10.0.0.51     store1
10.0.0.52     store2_
```

Reboot

On compute:

```
Ubuntu 18.04.6 LTS server1 tty1
server1 login: fjwu
Password:
Last login: Fri Dec  1 06:03:54 UTC 2023 on ttyl
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0–213–generic x86_64)
* Documentation: https://help.ubuntu.com
* Management:
                  https://landscape.canonical.com
* Support:
                  https://ubuntu.com/advantage
 System information as of Fri Dec 1 06:47:39 UTC 2023
 System load: 0.08
                                 Users logged in:
               41.3% of 9.59GB
                                 IP address for enp0s3: 10.0.2.15
 Usage of /:
                                 IP address for enp0s8: 10.0.0.11
 Memory usage: 17%
                                 IP address for enp0s9: 192.168.222.3
 Swap usage:
               0%
               100
 Processes:
```

```
fjwu@server1:~$ sudo su –
[sudo] password for fjwu:
root@server1:~# clear_
```

Change the IP:

```
# /etc/netplan for current configuration.
# To re-enable ifupdown on this system, you can run:
auto lo
iface lo inet loopback

auto enp0s3
iface enp0s3 inet dhcp

auto enp0s8
iface enp0s8 inet static
address 10.0.0.31
netmask 255.255.255.0

auto enp0s9
iface enp0s9 inet manual
up ip link set dev $IFACE up
down ip link set dev $IFACE down
```

```
~
~
~
"/etc/network/interfaces" 19L, 405C written
root@compute:~# clear
```

Change hostname:

```
127.0.0.1 localhost
127.0.1.1 compute

# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

10.0.0.11     server1
10.0.0.31     compute
10.0.0.51     store1
10.0.0.52     store2
```

```
~
"/etc/hosts" 14L, 295C written
root@server1:~# vim /etc/hostname_
```

```
compute
~
~
~
~
```

Clear and reboot

Step 6:

Verify networking on all machines:

- 1. Ping all machines to each other
- 2. Ping theskillpedia.com to verify internet

Ping on Server1:

```
oot@server1:~# ping store1
PING store1 (10.0.0.51) 56(84) bytes of data.
64 bytes from store1 (10.0.0.51): icmp_seq=1 ttl=64 time=0.347 ms
64 bytes from store1 (10.0.0.51): icmp_seq=2 ttl=64 time=0.820 ms
64 bytes from store1 (10.0.0.51): icmp_seq=3 ttl=64 time=1.12 ms
64 bytes from store1 (10.0.0.51): icmp_seq=4 ttl=64 time=0.969 ms
`C
--- store1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3093ms
rtt min/avg/max/mdev = 0.347/0.815/1.126/0.292 ms
root@server1:~# ping store2
PING store2 (10.0.0.52) 56(84) bytes of data.
From server1 (10.0.0.11) icmp_seq=1 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=2 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=3 Destination Host Unreachable
--- store2 ping statistics ---
5 packets transmitted, O received, +3 errors, 100% packet loss, time 4932ms
pipe 4
root@server1:~# ping compute
PING compute (10.0.0.31) 56(84) bytes of data.
From server1 (10.0.0.11) icmp_seq=1 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=2 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=3 Destination Host Unreachable
-- compute ping statistics ---
4 packets transmitted, O received, +3 errors, 100% packet loss, time 3057ms
pipe 4
root@server1:~#
```

Ping on store1:

```
fjwu@store1:~$ ping server1
PING server1 (10.0.0.11) 56(84) bytes of data.
64 bytes from server1 (10.0.0.11): icmp_seq=1 ttl=64 time=0.348 ms
64 bytes from server1 (10.0.0.11): icmp_seq=2 ttl=64 time=1.07 ms
'n.
-–– server1 ping statistics –-
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 0.348/0.710/1.072/0.362 ms
fjwu@store1:~$ ping store2
PING store2 (10.0.0.52) 56(84) bytes of data.
From store1 (10.0.0.51) icmp_seq=1 Destination Host Unreachable
From store1 (10.0.0.51) icmp_seq=2 Destination Host Unreachable
From store1 (10.0.0.51) icmp_seq=3 Destination Host Unreachable
С,
--- store2 ping statistics ---
4 packets transmitted, O received, +3 errors, 100% packet loss, time 3107ms
pipe 4
fjwu@store1:~$ ping compute
PING compute (10.0.0.31) 56(84) bytes of data.
From store1 (10.0.0.51) icmp_seq=1 Destination Host Unreachable
From store1 (10.0.0.51) icmp_seq=2 Destination Host Unreachable
From store1 (10.0.0.51) icmp_seq=3 Destination Host Unreachable
'n.
 -- compute ping statistics ---
4 packets transmitted, O received, +3 errors, 100% packet loss, time 3063ms
pipe 4
fjwu@store1:~$ _
```

```
fjwu@store1:~$ ping theskillpedia.com
PING theskillpedia.com (132.148.165.213) 56(84) bytes of data.
64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=1 ttl=47 t
64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=2 ttl=47 t
^C
--- theskillpedia.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 258.618/266.665/274.713/8.064 ms
fjwu@store1:~$ _
```

Ping with store2:

```
root@store2:~# ping server1
PING server1 (10.0.0.11) 56(84) bytes of data.
64 bytes from server1 (10.0.0.11): icmp_seq=1 ttl=64 time=0.020 ms
64 bytes from server1 (10.0.0.11): icmp_seq=2 ttl=64 time=0.076 ms
64 bytes from server1 (10.0.0.11): icmp_seq=3 ttl=64 time=0.056 ms
^C
--- server1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2048ms
rtt min/avg/max/mdev = 0.020/0.050/0.076/0.024 ms
root@store2:~# ifup enp0s8
ifup: interface enp0s8 already configured
root@store2:~#
```

```
fjwu@store2:~$ ping store1
PING store1 (10.0.0.51) 56(84) bytes of data.
64 bytes from store1 (10.0.0.51): icmp_seq=1 ttl=64 time=0.730 ms
64 bytes from store1 (10.0.0.51): icmp_seq=2 ttl=64 time=0.876 ms
--- store1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.730/0.803/0.876/0.073 ms
fjwu@store2:~$ ping compute
PING compute (10.0.0.31) 56(84) bytes of data.
From server1 (10.0.0.11) icmp_seq=1 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=2 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=3 Destination Host Unreachable
Ъ.
--- compute ping statistics ---
5 packets transmitted, O received, +3 errors, 100% packet loss, time 4083m
pipe 4
fjwu@store2:~$ ping server1
PING server1 (10.0.0.11) 56(84) bytes of data.
64 bytes from server1 (10.0.0.11): icmp_seq=1 ttl=64 time=0.021 ms
64 bytes from server1 (10.0.0.11): icmp_seq=2 ttl=64 time=0.363 ms
--- server1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1047ms
rtt min/avg/max/mdev = 0.021/0.192/0.363/0.171 ms
fjwu@store2:~$ _
```

```
fjwu@store2:~$ ping theskillpedia.com

PING theskillpedia.com (132.148.165.213) 56(84) bytes of data.

64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=1 ttl=47 time=2
64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=2 ttl=47 time=2
^C
--- theskillpedia.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms

rtt min/avg/max/mdev = 243.008/255.347/267.686/12.339 ms

fjwu@store2:~$
```

Ping on compute:

```
fjwu@compute:~$ ping theskillpedia.com
PING theskillpedia.com (132.148.165.213) 56(84) bytes of data.
64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=1 ttl=47 time=
64 bytes from 213.165.148.132.host.secureserver.net (132.148.165.213): icmp_seq=2 ttl=47 time=
^C
--- theskillpedia.com ping statistics ---
3 packets transmitted, 2 received, 33% packet loss, time 2001ms
rtt min/avg/max/mdev = 246.591/248.541/250.492/2.013 ms
fjwu@compute:~$
```

```
root@compute:~# ping server1
PING server1 (10.0.0.11) 56(84) bytes of data.
64 bytes from server1 (10.0.0.11): icmp_seq=1 ttl=64 time=0.019 ms
64 bytes from server1 (10.0.0.11): icmp_seq=2 ttl=64 time=0.078 ms
64 bytes from server1 (10.0.0.11): icmp_seq=3 ttl=64 time=0.084 ms
C)
 --- server1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2041ms
rtt min/avg/max/mdev = 0.019/0.060/0.084/0.030 ms
root@compute:~# ping store1
PING store1 (10.0.0.51) 56(84) bytes of data.
64 bytes from store1 (10.0.0.51): icmp_seq=1 ttl=64 time=0.350 ms
64 bytes from store1 (10.0.0.51): icmp_seq=2 ttl=64 time=0.975 ms
 -- store1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1151ms
rtt min/avg/max/mdev = 0.350/0.662/0.975/0.313 ms
root@compute:~# ping store2
PING store2 (10.0.0.52) 56(84) bytes of data.
From server1 (10.0.0.11) icmp_seq=1 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=2 Destination Host Unreachable
From server1 (10.0.0.11) icmp_seq=3 Destination Host Unreachable
 --- store2 ping statistics ---
5 packets transmitted, O received, +3 errors, 100% packet loss, time 4934ms
pipe 4
root@compute:~# _
```